



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/826,752	04/16/2004	Romeo Emmanuel P. Alvarez		1220

7590 09/10/2008
ROMEO EMMANUEL P. ALVAREZ
526 WOODLANDS DRIVE 14
#07-463
SINGAPORE, 730526
SINGAPORE

EXAMINER

MITCHELL, JAMES M

ART UNIT	PAPER NUMBER
----------	--------------

2813

MAIL DATE	DELIVERY MODE
-----------	---------------

09/10/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/826,752

Applicant(s)ALVAREZ, ROMEO EMMANUEL
P.**Examiner**

JAMES M. MITCHELL

Art Unit

2813

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 June 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 21-26, 28 and 29 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 21-26, 28 and 29 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 16 April 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☒ Certified copies of the priority documents have been received in Application No. 10/315,534.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. This office action is in response to applicant's request for continued examination filed June 12, 2008.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 21-24, 26, 28 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sakurai et al. (U.S. 2001/0040290) in combination with Christiansen et al. (U.S. 4,996,629).

4. Sakurai (Fig. 1, 2, 12) discloses:

(cl. 21) a wafer level chip scale package comprising; a semiconductor die (10) having a plurality of pads (12) on a surface; pillar conductors (e.g. provide upright support; 90) coupled to and extending vertically (e.g. in vertical direction) a first predetermined distance from the surface of the semiconductor die; an etch resistant layer (92) on free ends of the pillar conductors; a layer of insulation (14) on the surface, the layer of insulation having an exposed surface (e.g. exposing surface of pad; Fig. 2b) a second predetermined distance from the surface of the semiconductor die, wherein the second predetermined distance is less than the first predetermined distance and wherein said layer of insulation partially covers lower portions of side surfaces (e.g. lower vertical

Art Unit: 2813

portion of conductor covered) of substantially all of the conductors; and reflowable material (44) attached to the etch resistant layer and to at least portions of side surfaces of substantially all of the pillar conductors (Fig. 12b);

(cl. 22) wherein the conductors comprise copper conductors (Par. 0103);

(cl. 24) wherein the etch resistant layer comprises a layer of gold (0145; Par. 160);

(cl. 26) wherein the thickness of the layer of gold is less than the difference between the first predetermined distance and the second predetermined distance (Fig 12b);

(cl. 28) the reflowable material comprises solder (0144);

(c. 29) wherein the solder comprises eutectic solder (Par. 0147).

5. Sakurai does not appear to explicitly disclose its insulating passivation layer being made from epoxy.

6. However, Christiansen (Col. 5, Lines 2-4) teaches epoxy as a passivation material.

7. It would have been obvious to one of ordinary skill in the art to form the passivation of Sakurai as an epoxy to provide a passivation layer as required by Sakurai¹.

8. Furthermore, the selection of an epoxy is known as a passivation material as evidence for example by Christiansen, therefore, it would have been obvious to one of ordinary skill in the art to select the claimed material, since it has been held that the selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination². Sinclair & Carroll Co. v. Interchemical

¹ Materials disclosed for Sakurai were only examples (see Par. 0097).

Art Unit: 2813

Corp., 325 U.S. 327, 65 USPQ 297 (1945). See, M.P.E.P §2144.07.

9. With respect to the process limitation of claim 23 that copper is “plated,” the prior art structure is the same as the claimed invention. “[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.” *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985).

10. Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sakurai (U.S. 2001/0040290) and Christiansen et al. (U.S. 4,996,629) as applied to claim 21 and further in combination with Jin (U.S. 2003/0219966).

11. Sakurai does not disclose use of a combination of nickel and gold layers under its reflowable material.

12. However, Jin (Fig .12) utilizes of a combination of nickel and gold layers (30, 32) under its reflowable material (36).

13. It would have been obvious to one of ordinary skill in the art to incorporate nickel with the gold of Sakurai in order to improve pitch as taught by Jin (Par. 0009-0014).

² Applicant's lack of criticality is further evidences by his disclosure that his material can be different types (see PGPUB 2004/0198022; Par. 0010).

Art Unit: 2813

14. Claims 21-24, 26, 28 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sakurai et al. (U.S. 2001/0040290) in combination with Capote et al. (U.S. 2002/0031868).

15. Sakurai (Fig. 1, 2, 12) discloses:

(cl. 21) a wafer level chip scale package comprising; a semiconductor die (10) having a plurality of pads (12) on a surface; pillar conductors (e.g. provide upright support; 90) coupled to and extending vertically (e.g. in vertical direction) a first predetermined distance from the surface of the semiconductor die; an etch resistant layer (92) on free ends of the pillar conductors; and reflowable material (44) attached to the etch resistant layer and to at least portions of side surfaces of substantially all of the pillar conductors (Fig. 12b);

(cl. 22) wherein the conductors comprise copper conductors (Par. 0103);

(cl. 24) wherein the etch resistant layer comprises a layer of gold (0145; Par. 160);

(cl. 26) wherein the thickness of the layer of gold is less than the difference between the first predetermined distance and the second predetermined distance (Fig 12b);

(cl. 28) the reflowable material comprises solder (0144);

(c. 29) wherein the solder comprises eutectic solder (Par. 0147).

16. Sakurai does not appear to explicitly disclose; an epoxy, underfill layer exposed surface that is a second predetermined distance from the surface of its semiconductor die, wherein the second predetermined distance is less than a first predetermined distance of its pillars and wherein said layer of insulation partially covers lower portions of side surfaces of substantially all of the conductors.

Art Unit: 2813

17. However, Capote (e.g. Fig. 17) utilizes an epoxy (37; Par. 0081) exposed surface (e.g. portion closest to bottom of pillar, 14) that is a second predetermined distance from the surface of its semiconductor die (10), wherein the second predetermined distance is less than a first predetermined distance of its pillars and wherein said epoxy partially covers lower portions of side surfaces of substantially all of the conductors.

18. It would have been obvious to one of ordinary skill in the art to one of ordinary skill in the art to form an epoxy material below a portion of the pillar of Sakurai in order to form a multilayer underfill with polymer flux that does not reduce reliability as taught by Capote (Par. 0020).

19. With respect to the thickness of the epoxy being less than the pillar, Capote teaches either a small (39) or large (37; e.g. Fig. 25, 26) amount of epoxy formed on its die whereby the difference of epoxy needed to fully fill the gap between the chip and a substrate is supplied on the substrate. As such, it would have been obvious to one of ordinary skill in the art to form epoxy at various thickness along die of Sakurai, since the additional amount will be applied to the substrate as taught by Capote (e.g. Fig. 13-Fig 14; Fig. 26-Fig. 27).

20. Furthermore applicant has not disclosed that its thickness is for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. As such, the selected dimension would have been obvious to one of ordinary skill in the art, since it has been held that mere dimensional limitations are prima facie obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, *In re Rose*, 220 F.2d

Art Unit: 2813

459, 105 USPQ 237 (CCPA 1955); In re Rinehart, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); Gardner v. TEC Systems, Inc., 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); In re Dailey, 357 F.2d 669, 149 USPQ 47 (CCPA 1966).

21. Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sakurai (U.S. 2001/0040290) and Capote et al. (U.S. 2002/0031868) as applied to claim 21 and further in combination with Jin (U.S. 2003/0219966).

22. The modified structure of Sakurai does not disclose use of a combination of nickel and gold layers under its reflowable material.

23. However, Jin (Fig .12) utilizes of a combination of nickel and gold layers (30, 32) under its reflowable material (36).

24. It would have been obvious to one of ordinary skill in the art to incorporate nickel with the gold of Sakurai in order to improve pitch as taught by Jin (Par. 0009-0014).

Response to Arguments

25. Applicant's arguments filed June 12, 2008 with respect to his amended claims have been fully considered but they are not persuasive. Applicant contends that his invention is patentable over the prior art, because Sakaurai small amount of passivation layer is applied before the formation of pillars and etching the passivation layer in contrast to Christiansen that applies large amount of epoxy after completion of wiring bonding. Examiner respectfully disagrees. As indicated previously, Christiansen was

Art Unit: 2813

used solely for the purpose of establishing that epoxy is a known passivating material and that its use at any stage & in any manner consistent with its intended purpose (e.g. passivation/protection of IC components) is obvious to one of ordinary skill in the art. See 2144.07. The fact that Christiansen may have applied its passivating material by a different process or amount has no bearing on the fact that epoxy is a known passivation material. Applicant's remarks are insufficient to rebut examiner's prima facie case.

Conclusion

26. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The prior art discloses: in Akram (U.S. 2001/0051392), Brooks (U.S. 5,496,775), Sawai et al. (U.S. 5,554,887) and Coucoulas (U.S. 3,959,874) the use of epoxy below a pillar portion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JAMES M. MITCHELL whose telephone number is (571)272-1931. The examiner can normally be reached on M-F 8:00-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead Jr. can be reached on (571) 272-1702. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2813

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

September 8, 2008
/James M. Mitchell/
Examiner, Art Unit 2813